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FOREST INSECT and DISEASE MANAGEMENT

Rocky Mountain Region

1979 Annual Report

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U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE

FOREST INSECT AND DISEASE MANAGEMENT

ANNUAL REPORT

ROCKY MOUNTAIN REGION (R-2)

1979

by

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and

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June 1980

Forest Insect and Disease Management
State and Private Forestry
Rocky Mountain Region
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ACKNOWLEDGEMENT

The Forest Insect and Disease Management staff extends our appreciation to all cooperators for aiding in this annual report. The following organizations contributed significantly to this report: Colorado State Forest Service; Colorado State University; Kansas State University, Cooperative Extension Service; Nebraska State and Extension Service; Rocky Mountain Forest and Range Experiment Station; and South Dakota Department of Game, Fish, and Parks. Without the aid of these cooperators this report would not be possible.

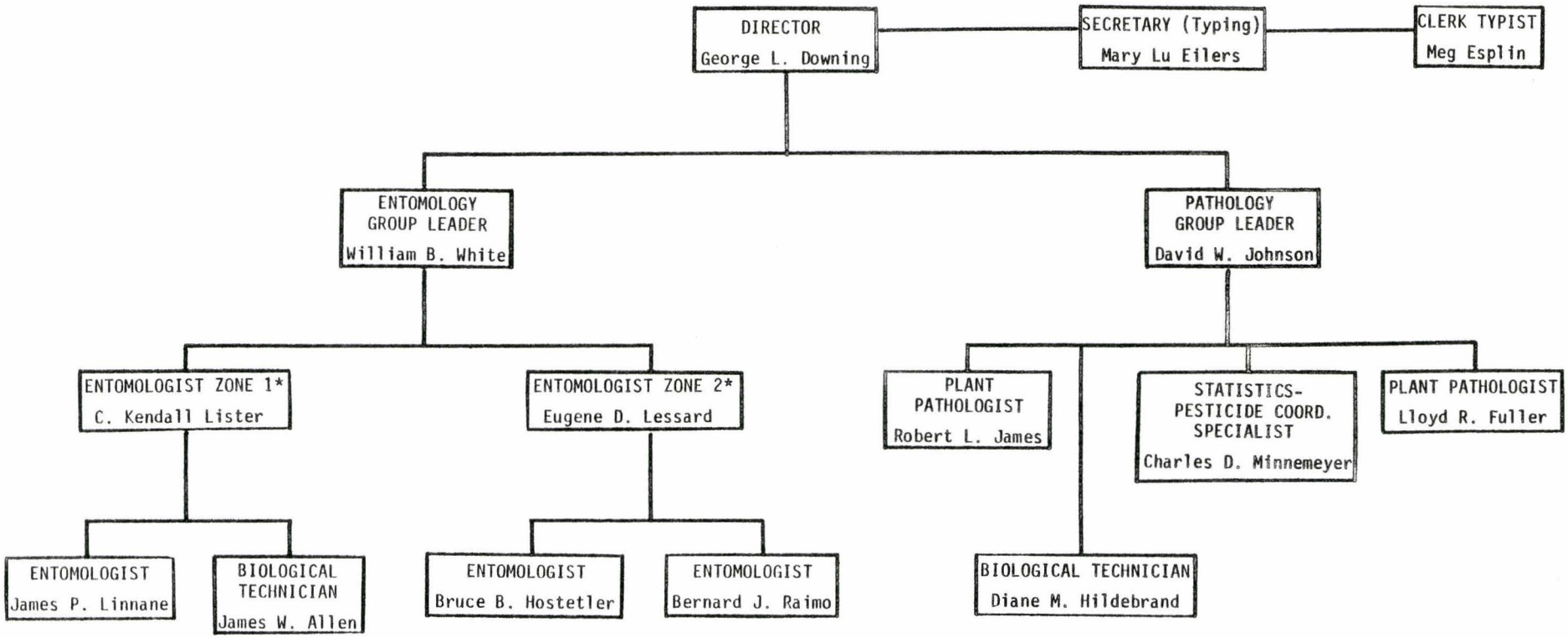
INTRODUCTION

Forest Insect and Disease Management (FI&DM) is responsible for insect and disease prevention, detection, evaluation, and suppression on Forest Service lands as stated in the Cooperative Forestry Assistance Act of 1978 (Public Law 95-313). FI&DM is responsible for detection, evaluation, and providing technical advice about prevention and suppression of forest insect and disease problems on Federal lands administered by the USDA, Forest Service. State agencies and private landowners are responsible for forest insect and disease control on non-Federal lands. Federal forest management assistance programs, both financial and technical, are available to state and private landowners. In 1979, ground and aerial surveys were used to detect insect and disease infestations throughout the Rocky Mountain Region (R-2). Some surveys were conducted in cooperation with state pest specialists in Colorado, Kansas, Nebraska, and South Dakota.

Additional information on specific pest problems may be requested from FI&DM located at the Regional Office in Lakewood, Colorado (telephone 303-234-4877).

FOREST INSECT AND DISEASE MANAGEMENT

ORGANIZATION CHART



* Zone 1 - Colorado; Zone 2 - Kansas, Nebraska, South Dakota and Wyoming

CONDITIONS IN BRIEF

Mountain pine beetle is the most destructive forest insect pest within R-2. Substantial ponderosa pine mortality occurred along the Colorado Front Range and the Black Hills of South Dakota. Beetle infestations increased on the southern portion of the Shoshone National Forest in Wyoming. Ponderosa pine mortality was also detected on the Bighorn National Forest in Wyoming. Programs to suppress mountain pine beetle activity using silvicultural methods are ongoing in Colorado and South Dakota.

Western spruce budworm is a serious defoliator of Douglas-fir and white fir. The major infestation occurred along the Colorado Front Range. Small infestations were detected on the San Juan National Forest, Colorado, and the Shoshone National Forest, Wyoming. Repeated budworm defoliation occurred in many areas.

Jack pine budworm caused moderate to severe defoliation of 2,400 acres of jack pine on the Bessey District, Nebraska National Forest. This is the first budworm outbreak reported for this area.

Lodgepole pine dwarf mistletoe and comandra rust are the most significant diseases of lodgepole pine in R-2. Annosus root rot of true firs, black-stain root disease of pinyon, and armillaria root rot in all major forest types is being evaluated for regional distribution and impact on management objectives. Diplodia tip blight was reported for the first time on mature native ponderosa pine in the Black Hills of South Dakota. Other diseases in mountainous areas were western gall rust, cryptosphaeria canker of aspen, ink spot disease of aspen, aspen leaf blight, cottonwood leaf rust, cercospora blight of juniper, and dothistroma needle blight.

Colorado State Forest Service and Cooperative Extension Service continued their participation in the Federal Dutch Elm Disease Demonstration Project.

Diseases in the Great Plains included stem rot of green ash, honeylocust canker, Russian olive canker, cytospora canker of cottonwood, bacterial canker of cottonwood, hackberry decay, oak wilt and honeysuckle blight.

The pine wood nematode was observed for the first time in Kansas and Nebraska. Additional surveys are planned for 1980.

1979 was the last year for evaluating the ectomycorrhizal fungus *Pisolithus tinctorius* in several nurseries. Outplanting is scheduled for spring 1980. Measurements of tree and ectomycorrhizal survival will be taken annually for the first two years and biennial for a minimum of 10 years.

STATUS OF INSECTS

BARK BEETLES

MOUNTAIN PINE BEETLE: *Dendroctonus ponderosae* Hopkins

This insect is a significant pest to ponderosa pine in the Front Range of Colorado, the Black Hills of South Dakota and Wyoming, and the eastern slope of the Bighorn Mountains of Wyoming. The beetle also caused losses in lodgepole pine and limber pine on the Shoshone National Forest southwest of Lander, Wyoming.

Mountain pine beetle (MPB) epidemics in ponderosa pine continued in northern portions of the Black Hills. Surveys in the southern half of the Bear Lodge Mountains showed a 4:1 increase in tree mortality from 1978 to 1979 with an average of 5.8 infested trees per acre. Surveys on Limestone Plateau indicated a decreasing population trend. The ratio of 1979- to 1978-infested trees was 0.42:1 with an average of 0.3 infested trees per acre. Surveys on 30,000 acres of state, private, and federal lands around Lead and Deadwood, South Dakota, showed a 1.3:1 increase in tree mortality from 1978 to 1979 with an average of 0.8 infested trees per acre.

In southern portions of the Black Hills MPB populations were endemic except in the Deerfield Lake, Bear Mountain and Sylvan Lake areas.

On the Shoshone National Forest, MPB infestations in lodgepole pine were increasing southwest of Lander, Wyoming. Surveys will be conducted in this area in the fall of 1980.

Pockets of MPB-infested ponderosa pine were detected along the eastern slope of the Bighorn Mountains. The largest concentration of 1978-infested trees was found along Highway 14 near Sand Turn Observation Site.

Of the 1.4 million acres of ponderosa pine type in the Colorado Front Range, an estimated 350,000 acres had detectable infestations of MPB. Within infested areas approximately 420,000 ponderosa pines were attacked in 1978, with 96,000 of these trees being salvaged or treated chemically to prevent beetle emergence. In addition, silvicultural treatments, consisting primarily of thinning, were implemented to help prevent future beetle epidemics. These suppression and prevention treatments were confined to more intensively managed areas.

Ponderosa pine mortality estimates for Colorado were obtained in 1979 using a conventional survey technique involving tree counts from large-scale color aerial photographs and ground verification. Results of a new photographic survey technique, using color-infrared photographs

taken at high altitude by an optical bar camera and ground checking, were compared with those of the conventional survey. The comparison was favorable. Plans are underway for an operational survey in 1980 using optical bar techniques to obtain number and volume of MPB-killed ponderosa pines in the Colorado Front Range.

IPS BEETLES: *Ips* spp.

Ips beetles, generally considered secondary invaders, killed approximately 30 percent of the ponderosa pines left after a thinning operation on private land near Keystone, South Dakota.

Some ponderosa pine *Ips*-caused mortality was noticed after prescribed burns on the Nemo Ranger District, Black Hills National Forest, and the Spearfish State Farm. *Ips*-caused mortality was also reported in Rapid City, South Dakota, to pines damaged by construction.

WESTERN BALSAM BARK BEETLE: *Dryocoetes confusus* Swaine

Western balsam bark beetle activity was evident on subalpine fir throughout Colorado and Wyoming. Activity was greatest on the Colorado western slope; however, an intensive detection survey was not conducted during 1979.

DEFOLIATORS

WESTERN SPRUCE BUDWORM: *Choristoneura occidentalis* Freeman

Western spruce budworm caused defoliation on approximately 930,000 acres of Douglas-fir and white fir in Colorado. It is predicted that Front Range budworm populations will remain static through 1980. Light defoliation was detected on the San Isabel and San Juan National Forests. Moderate to heavy defoliation was detected on the Pike, Arapaho, and Roosevelt National Forests. Insufficient information is available to predict 1980 population trends in other areas of Colorado.

In 1979, approximately 12,000 acres of privately-owned Douglas-fir forest in Jefferson, Boulder, and Larimer counties were sprayed, at owner expense, for budworm control using Sevin-4-Oil and Orthene.

Light budworm defoliation was detected in Douglas-fir and white fir stands on the Clarks Fork District, Shoshone National Forest. Top-killing was apparent in pure Douglas-fir stands on the Arapaho National Forest in Colorado. Defoliation was negligible in all other areas surveyed.

JACK PINE BUDWORM: *Choristoneura pinus* Freeman

Heavy defoliation by jack pine budworm was detected on approximately 1,100 acres of jack pine on the Bessey District, Nebraska National Forest. Light to medium defoliation was observed on the remaining 1,300 acres of jack pine. Egg mass sampling in August indicated a potential for high budworm populations again in 1980. A suppression project using a microbial agent (*Bacillus thuringiensis*) is scheduled in spring 1980.

DOUGLAS-FIR TUSSOCK MOTH: *Orgyia pseudotsugata* (McDunnough)

Douglas-fir tussock moth activity was, as is typical, confined to urban areas along the Colorado Front Range, especially in Denver, Colorado Springs, and Boulder. Damage to ornamental spruce trees was of concern to many homeowners.

PINE NEEDLE MINER: *Coleotechnites ponderosae* Hodges & Stevens

Damage to ponderosa pines by a species of pine needle miner was quite noticeable in Boulder, Jefferson, Elbert, Douglas, El Paso, and Larimer counties along the Colorado Front Range. This species was also reported from ponderosa pine in La Plata County in southwestern Colorado.

ELM LEAF BEETLE: *Pyrrhalta luteola* (Muller)

This insect was present in substantial numbers in urban trees on lower elevations in the Black Hills of South Dakota and caused some defoliation in urban and shelterbelt trees east of the Missouri River. Elm leaf beetle populations in Kansas remained at moderate levels in most cities. Beetles again caused severe defoliation of many Siberian and American elms in Denver and in several other Colorado cities.

WESTERN TENT CATERPILLAR: *Malacosoma californicum* (Packard)

Heavy defoliation by the western tent caterpillar was observed on about 16,000 acres of aspen in Colorado on the Pagosa District, San Juan National Forest, and on adjacent private lands. Surveys indicate that heavy defoliation will occur again in 1980 in these same areas. A suppression project using a microbial agent (*Bacillus thuringiensis*) was an alternative being considered for heavily defoliated areas.

Some tent caterpillar defoliation was also detected in Colorado on the San Isabel National Forest. This defoliation occurred on aspen stands in the vicinity of Pass Creek and Apishapa Pass.

PINE TORTRIX: *Choristoneura lambertiana ponderosana* Obraztsov

Populations of pine tortrix continued to cause visible defoliation to ponderosa pine in Colorado on the Roosevelt and Pike National Forests. Defoliation was most apparent along the north fork of the South Platte River.

ASPEN LEAFMINER: *Phyllocnistis populiella* Chambers

An aspen leafminer epidemic continued in the Black Hills in 1979. Defoliation was more intense in the northern portion than in the southern portion. Tree mortality has not been detected.

EUROPEAN PINE SAWFLY: *Neodiprion sertifer* (Geoffroy)

Large European pine sawfly populations were reported in Scots pine Christmas tree plantations throughout eastcentral Kansas. Populations were probably the highest yet recorded in Kansas.

LINDEN LOOPER: *Erannis tiliaria* (Harris)

Linden looper and another lepidopterous species, the bertha armyworm (*Mamestra* (= *Barathra*) *configurata* (Walker), severely defoliated approximately 1,000 acres of native hardwoods in Newton Hills State Park, Lincoln County, South Dakota. Bur oak, green ash, and Linden sustained 50-100 percent defoliation. Black walnut exhibited little or no damage. Insect populations will be monitored during 1980.

MISCELLANEOUS INSECT PROBLEMS

PINE TIP MOTHS: *Rhyacionia bushnelli* (Busck), *R. frustrana* (Comstock), and *R. neomexicana* (Dyar)

Pine tip moths were observed in South Dakota on Black Hills ponderosa pine and in shelterbelt pines throughout the area east of the Missouri River. In Kansas, Nantucket pine tip moth (*R. frustrana*) populations were apparently the lowest since 1972; overall, tip moth damage to pines in shelterbelts and Christmas tree plantations was not severe. The southwestern pine tip moth (*R. neomexicana*) was reported from ponderosa pine in Adams, Boulder, and Larimer Counties, Colorado. Status of pine tip moth populations was not received from Nebraska.

ZIMMERMAN PINE MOTH: *Dioryctria zimmermani* (Grote)

The Zimmerman pine moth was observed in Minnehaha County, South Dakota, and is probably widespread throughout the eastern half of the state. The moth was detected throughout Nebraska and caused significant damage in a ponderosa pine plantation near Chadron in the northwest part of the state. This insect has been detected in Logan, Phillips, and Sedgwick counties in northeastern Colorado adjacent to Nebraska but has not been found in Kansas.

PINYON PITCH MASS BORERS: *Dioryctria* spp.

Pitch mass borers collected from pinyon in Colorado by personnel from Colorado State University were identified by Dr. Akira Mutuura, Biosystematics Research Institute, Agriculture Canada, Ottawa, as: *Dioryctria ponderosae* Dyar and *Dioryctria* sp. near *okanaganella* Mutuura and Monroe.

Pitch mass borers (probably the same species mentioned above) were noticed on pinyon within the Great Sand Dunes National Monument in southern Colorado.

A FLATHEADED CEDAR BORER: *Chrysobothris texana* LeConte

Many shelterbelts in southcentral and southwestern Kansas exhibited significant eastern redcedar mortality in 1979. Flatheaded borers were found in many dying and dead trees and may be contributing to mortality. A bark beetle, *Phloeosinus dentatus* (Say), was associated with some dying trees. Mortality was not found in natural redcedar stands.

SPITTLEBUG: presumably *Clastoptera distincta* Doering

This spittlebug species was found on ponderosa pine dwarf mistletoe (*Arceuthobium vaginatum* subsp. *cryptopodum* (Engelm.) Hawksworth and Wiens) in the Narraguinnep Research Natural Area of the San Juan National Forest. This is the first report in Colorado. Although the spittlebug is common and frequently kills dwarf mistletoe shoots in Arizona, it appears to be too rare to reduce dwarf mistletoe populations in Colorado ponderosa pine stands.

DARK-WINGED FUNGUS GNATS

Damage to seeds and seedlings of mountain-mahogany, chokecherry, and aspen cuttings at the Mt. Sopris Nursery, Carbondale, Colorado, was apparently caused by an unknown species of dipterous larva in the family Sciaridae. Affected seeds did not germinate and a significant number of seedlings died apparently due to feeding on the roots by the fungus gnat larvae.

PINYON NEEDLE SCALE: *Matsucoccus acalyptus* Herbert

Pinyon needle scale was evident on about 150 acres of pinyon in Colorado near Cottonwood Creek on the Saguache Ranger District, Rio Grande National Forest.

OTHER INSECTS REPORTED

Specific and Common Names	Host(s)	Location(s)	Remarks
Agrilus anxius Gory, bronze brich borer	paper birch, white birch	Huron and Beadle Cos., SD; eastern Kansas	Found in ornamentals
Alsophila pometaria (Harris), fall cankerworm	elm species, hackberry	Logan Co., CO	Found in shelterbelts
Asterocampa celtis (Boisduval & LeConte), a hackberry butterfly	hackberry	Eastcentral KS	
Chrysomela scripta Fabricius, cottonwood leaf beetle	cottonwood species, aspen	Black Hills and Pierre, SD; throughout KS; Boulder, Larimer, Logan Cos., CO	Severe defoliation of some aspen regeneration in Black Hills
Cinara spp., pine aphids	Austrian pine, ponderosa pine	Yankton Co., Trip Co., and Black Hills, SD	
Coloradia doris Barnes, Black Hills pandora moth	ponderosa pine	Larimer Co., CO	
Corythucha ciliata (Say), sycamore lace bug	sycamore	Eastern KS	Leaf damage to ornamental sycamores
Datana integerrima Grote & Robinson, walnut caterpillar	black walnut	Southeastern SD; KS	Severe defoliation on one plantation in Yankton Co., SD
Dendroctonus adjunctis Blandford, roundheaded pine beetle	ponderosa pine	Archuleta and La Plata Cos., CO	
Dendroctonus brevicomis LeConte, western pine beetle	ponderosa pine	San Juan National Forest, CO	Found in old growth pine
Dendroctonus pseudotsugae Hopkins, Douglas-fir beetle	Douglas-fir	Chaffee, Conejos, Hinsdale, La Plata, Larimer, Montezuma, Rio Grande, Cos., CO	Found in forest trees
Dendroctonus rufipennis (Kirby), spruce beetle	Engelmann spruce, white spruce	CO, WY	Low level populations throughout range of spruce
Dendroctonus valens LeConte, red turpentine beetle	pine species	CO, SD, WY	Found in spots throughout range of pines in these states.

OTHER INSECTS REPORTED - (continued)

Specific and Common Names	Host(s)	Location(s)	Remarks
Dryocampa (= Anisota) rubicunda (Fabricius), greenstriped mapleworm	maple species	Eastern KS	
Gossyparia spuria (Modeer), European elm scale	American elm	western half of KS; throughout CO; Black Hills area, SD	
Grasshoppers	All tree species	CO, WY, SD, NE, KS	Populations high in plains areas of these states; damage to young shelterbelt and urban plantings
Halisodota ingens Hy. Edwards, tiger moth	ponderosa pine	Boulder Co., CO	
Hemileuca nevadensis Stretch, Nevada buck moth	cottonwood	Larimer, Saguache, Yuma Cos., CO	Populations much lower in Colorado than 1978
Hyphantria cunea (Drury), fall webworm	cottonwood, willow, birch, ash	Chaffee, Mesa, Otero, Yuma Cos., CO	
Leperisinus sp., ash bark beetle	green ash	Mesa, Larimer Cos., CO	
Malacosoma americanum (Fabricius), eastern tent caterpillar	willow	Sedgwick Co., CO	First record of occurrance of this species in Colorado. Larvae, not egg masses, were found on willow along the South Platte River
Malacosoma disstria Hübner, forest tent caterpillar	aspen, willow	Larmier and Mesa Cos., CO	
Malacosoma tigris (Dyar), Sonoran tent caterpillar	gambel oak	El Paso and Pueblo Cos., CO	
Malacosoma sp., tent caterpillar	chokecherry	Minnehaha and Sioux Falls Cos.,SD	
Neodiprion sp., pine sawflies	ponderosa pine	Larimer, Lincoln, Phillips, Washington Cos., CO	Found in shelterbelts
Neophasia menapia (Felder & Felder), pine butterfly	ponderosa pine	Boulder, Elbert, Larimer Cos.,CO	
Oligonychus milleri McGregor, spider mite	Scots pine	Eastern and southcentral KS	Considerable damage to Christmas tree plantations

OTHER INSECTS REPORTED - (continued)

Specific and Common Names	Host(s)	Location(s)	Remarks
Oligonychus ununguis (Jacobi), spruce spider mite	spruce, arborvitae, Douglas-fir	Western SD; Boulder and Larimer Cos., CO	
Pachypaylla celtidismamma (Riley), hackberry nipplegall maker	hackberry	CO, WY, SD, NE, KS	Common throughout the range of hackberry
Pachysphinx modesta (Harris), big poplar sphinx	cottonwood	Yuma Co., CO	Defoliated 15 mature trees in a shelterbelt
Paleacrita vernata (Peck), spring cankerworm	American and Siberian elms	SD	Present throughout SD; severe defoliation in cities of Aberdeen and Rapid City
Petrova spp., pitch nodule moths	Scots, Austrian, and ponderosa pines	SD; Larimer Co., CO	Common in Black Hills and in shelterbelts throughout eastern SD
Petrova arizonensis (Heinrich), pinyon pitch nodule moth	pinyon	CO	Common throughout range of pinyon in CO
Phloeosinus dentatus (Say), eastern juniper bark beetle	eastern redcedar	KS	Commonly found in shelterbelts
Plectrodera scalator (Fabricius), cottonwood borer	cottonwood species	CO, KS, NE, SD	Found in ornamental and native cottonwoods
Podosesia syringae (Harris), lilac borer	green ash, blue ash, lilac	SD, NE, KS; Larimer, Mesa, Sedgwick Cos., CO	
Popillia japonica Newman, Japanese beetle	----	KS	Caught in pheromone traps in railroad yard in Kansas City
Prionoxystus robinae (Peck), carpenterworm	elm and other hardwood species	KS, NE; Fremont, Logan, Otero, Phillips, Yuma Cos., CO	
Saperda calcarata Say, poplar borer	cottonwood species	Southcentral KS; Archuleta, Boulder, Larimer Cos., CO	
Scolytus sp. probably *ventralis* LeConte, fir engraver	white fir, Douglas-fir	Great Sand Dunes National Monument, CO; Conejos, Custer, El Paso, La Plata, Pueblo, Rio Blanco, Rio Grande, Saguache Cos., CO	Usually associated with *Fomes annosus* infection in white fir
Spittlebug, family cercopidae	juniper species	Fremont and Pueblo Cos., CO	In shelterbelts
Thyridopteryx ephemeraeformis (Haworth), bagworm	eastern recedar, arborvitae	KS	
Tropidosteptes amoenus Reuter, ash plant bug	green ash	Lincoln Co., SD; Mesa Co., CO	

STATUS OF DISEASES

DWARF MISTLETOES

DETECTION SURVEYS: A survey to assess incidence, growth loss and mortality caused by *Arceuthobium americanum* (Nutt. ex Engelm.) in lodgepole pine (*Pinus contorta* Dougl.) in the Rocky Mountain Region was conducted during 1977-79. The survey revealed that over 50 percent of the stands were infected (Table 1). Associated merchantable cubic foot volume loss will be developed at a later date. The southernmost known incidence of this disease in the central Rocky Mountains is West Pass Creek, north of Cochetopa Pass on the Cebolla Ranger District, Gunnison National Forest.

PRESUPPRESSION SURVEYS: During 1978-79 presuppression surveys for dwarf mistletoe were conducted by the Bureau of Land Management over 7,000 acres (397 stands) of lodgepole pine type in the vicinity of Independence Mountain, northwest of Cowdrey, Colorado. Sixty-two representative stands were processed through the Rocky Mountain Yield (RMYLD) program to estimate total merchantable yields with and without dwarf mistletoe control treatments. For several stands one or two intermediate cuts, to remove dwarf mistletoe infected overstory trees, made the difference as to whether or not merchantable sawtimber could be produced.

CONTRACT SURVEYS: Contracts were developed and signed to survey for lodgepole pine dwarf mistletoe on the Cebolla and Taylor River Ranger Districts, Gunnison National Forest. Survey areas included 30,000 acres of lodgepole pine type. Survey plots will be located at 5-chain intervals on a grid within each stand, providing a sampling intensity of 1 plot per 2.5 acres. Tree and dwarf mistletoe data will be summarized and yield of each stand projected using the RMYLD simulation program. Prescriptions for management activity will be developed after analysis of program statements.

VEGETATION SURVEYS: During the statewide survey of lodgepole pine dwarf mistletoe in Colorado, understory vegetation was recorded on 277 plots. Vegetative studies have not been completed for all lodgepole pine types in Colorado, therefore, it is not yet possible to classify them into formal habitat types. However, analyses of lodgepole pine plots based on predominant understory vegetation show marked differences in mistletoe frequency and intensity (Table 2).

CONTROL OPERATIONS: Dwarf mistletoe infected lodgepole pine residuals were felled in several clearcut units (512 acres) on the Wind River Ranger District, Shoshone National Forest. Similar overstory removal operations are planned for several Forests on an additional 700 acres in 1980.

STEM DISEASES

ASH STEM ROT: *Fomes fraxinophilus* (Peck) Sacc.

Stem rot by this fungus continued to cause damage to green ash (*Fraxinus pennsylvanica* Marsh.) trees in the Great Plains. Incidence surveys were initiated within natural hardwood stands in central and eastern Nebraska. Preliminary results indicated widespread occurrence in most stands where green ash was present. Disease incidence was directly related to tree age. Additional evaluations are planned in natural stands in Nebraska and within shelterbelts in eastern South Dakota.

COMANDRA BLISTER RUST: *Cronartium comandrae* Peck

This rust is the second most important disease problem to management of lodgepole pine. A roadside survey conducted within lodgepole pine type on National Forests revealed that 25 percent of the miles traveled were within rust-infested stands (Table 3). The results confirm the disease is most prevalent in northern Wyoming.

A five-year study of *C. comandrae* branch cankers on young lodgepole pine in Wyoming showed an average yearly growth rate, proximally, of 1.8 cm. Ninety-five percent of branch and stem cankers were within 1 m of ground level. Mortality of study trees during this period was 23 percent. Active branch infections (live and sporulating cankers) decreased by 56 percent, whereas inactive (dead and non-sporulating) branch infections increased by 262 percent. Active stem cankers decreased by 42 percent. Pruning branch cankers within 22 cm of the stem may reduce the chance of stem infection.

CRYPTOSPHAERIA CANKER AND LIBERTELLA DECAY:

Cryptosphaeria-caused cankers were found on aspen (*Populus tremuloides* Michx.) at various locations within Colorado. This fungus produced elongated, narrow bole cankers. The imperfect state (*Libertella* sp.) often caused sapwood decay. Trees with *Cytospora chrysosperma* sporulating on stem cankers may have been infected initially with *Cryptosphaeria*.

Cryptosphaeria populina Pers. was found on cottonwood plantings at Bessey Nursery in northcentral Nebraska.

CYTOSPORA CANKER: *Cytospora chrysosperma* (Pers.) F.

Cottonwood energy plantations in eastern Kansas which displayed heavy cytospora canker infection during previous years were less damaged this past year. Many trees appeared to callus over the cankers. More satisfactory growing conditions, especially moisture, may have been important in the apparent recovery of some infected trees. In Colorado this disease was present in natural stands of elm and cottonwood as well as ornamental trees.

HACKBERRY DECAY: Extensive decay of hackberry (*Celtis occidentalis* L.) was common on old-growth trees within Manhattan, Kansas. Unidentified fungi were sporulating on the boles of many trees lining the streets in older parts of the city.

HONEYLOCUST CANKER: *Thyronectria austro-americana* (Speg.) Seeler.

Thyronectria canker was found within a honeylocust (*Gleditsia triacanthos* L.) windbreak near Hays, Kansas (Ellis County). Progressive dieback with girdling cankers was common. Extensive gummosis on south sides of trees was characteristic. All honeylocust trees within the windbreak appeared affected. This disease has been reported near the Colorado Front Range (Larimer, Phillips, and Las Animas counties) and may be more widespread than previously thought.

HONEYSUCKLE BLIGHT: *Herpobasidium deformans* Gould.

Honeysuckle blight caused damage within the South Dakota State Nursery (Watertown) and nearby shelterbelts. Control in the nursery was obtained by spraying benomyl on young seedlings.

RUSSIAN OLIVE CANKER: *Botryodiplodia theobromae* Pat.

Cankers and dieback of Russian olive (*Elaeagnus angustifolia* L.) incited by *Botryodiplodia theobromae* were found within windbreaks in Minnehaha County, South Dakota. Extensive gummosis was associated with this disease. No tree mortality was found. This disease is probably widely distributed throughout Russian olive ornamental and windbreak plantings in the Great Plains.

TUBERCULARIA CANKER: *Tubercularia* sp.

Stem and branch cankers were observed within shelterbelts on *Ulmus pumila* in Weld, Logan, Phillips, Pueblo, Elbert, Kit Carson, and Lincoln counties of Colorado.

WESTERN GALL RUST: *Endocronartium harknessii* (J.P. Moore) Y. Hirat.

Since 1971, a 1,000 ponderosa pine seedling (2-0) sample has been collected from the USDA, Forest Service Bessey Nursery, located near Halsey, Nebraska, to determine levels of infection by western gall rust in nursery stock inspected and cleared for shipment to the National Forests. Evaluation of four 1,000 tree samples indicated a very low incidence of infected seedlings (0-0.5 percent). Apparently, seedlings became infected by spores released from infected windbreak ponderosa pine adjacent to the nursery. An annual program to rogue out rust galls and heavily infected trees adjacent to the nursery should keep infection levels of nursery stock low.

Western gall rust continues to be an important disease of ponderosa pine (*Pinus ponderosa* Laws.) in the Black Hills of South Dakota and the Nebraska National Forest. Severely infected trees are often killed in conjunction with bark beetle attack. Forest managers should consider current and potential disease impact when prescribing silvicultural treatments for infected stands.

VASCULAR WILTS

DUTCH ELM DISEASE: *Ceratocystis ulmi* (Buism.) C. Mor.

Colorado State Forest Service and the Cooperative Extension Service continued participation in the Federal Dutch Elm Disease Demonstration Project. The 1979 project year resulted in four of five Colorado demonstration communities showing a reduction in Dutch elm disease. Of these four communities, three, Eaton, Grand Junction, and La Junta, reported significant reduction in disease losses, while the fourth, Yuma, showed a slight improvement in an already good program.

The fifth community, Canon City, had a sharp rise in infection rate. The main reason is thought to be a slow county tree removal program in 1978 resulting in a late-season increase in loss. Many of the early-season 1979 cases are thought to be carryovers from that increase. Based on a more timely tree removal program and elimination of late-season infections, it is hoped a more effective program has been achieved.

Colorado's Utilization Program involving the sawmilling of urban elm trees into useable wood products was not feasible. Main drawbacks were difficulty in obtaining suitable logs from elm trees and failure of metal detection equipment.

Colorado State Forest Service is planning a pilot project to heat a state shop in Fort Collins using debarked, chipped, or split elmwood obtained from the city tree removal program.

OAK WILT: *Ceratocystis fagacearum* (Bretz) Hunt.

Oak wilt was found on residential post oaks (*Quercus stellata* Wangcnh.) near Paola, Kansas (Miami County). This endemic disease was found scattered throughout eastern portions of Nebraska and Kansas near the Missouri River. The disease is most serious when high value residential trees are killed.

During the week of February 27, 1980 the United States and the European Economic Communities (EEC) agreed to the following regulations concerning the export of oak logs and lumber from the United States.

Effective June 1, 1980:

Logs

a. All logs exported with bark intact (virtually all these logs will be for veneer products) to Belgium, West Germany, Holland, Luxembourg, and Italy must originate in a county free of oak wilt, including a 10 kilometer buffer zone from that county line.

b. Logs will be branded at the harvest site.

c. There will be two brands on each log to be exported: One will read USDA-APHIS, and the other will have a number assigned to the county of origin.

d. Each shipment must be accompanied by a Federal phytosanitary certificate (FPC) that identifies the species and origin of all logs by county.

e. Logs harvested prior to June 1, 1980, have until October 1, 1980, to reach their European destination and the FPC must state, "felled prior to June 1, 1980."

f. Logs going to France, Ireland, Great Britain, and Denmark will have to meet the requirements stated in the EEC Directive 77/93, dated December 21, 1976. Generally the Directive states that:

Logs must be bark free, plus one of the following:

- Square-edged with no wane.

- Dried to 20 percent or less moisture content.

Effective May 1, 1980:

Lumber

Belgium, West Germany, the Netherlands, Luxembourg, and Italy will accept lumber if there is no bark present and one of the following conditions are met:

a. All edges are square; no rounded edges on any board are acceptable.

b. The lumber has been dried to 20 percent or less moisture content by weight.

c. The lumber has been hot air-treated or water-treated.

   1. Hot air - 43^{o} centigrade for 48 hours or 54^{o} centigrade for 24 hours.

   2. Hot water - 43^{o} centigrade for 48 hours or 49^{o} centigarde- for 12 hours.

France, Ireland, Great Britain, and Denmark will accept lumber if there is no bark present and either (a) or (b) under lumber is complied with. All lumber currently in transient will be accepted until July 1, 1980, by all countries except France. Regulations for logs and lumber required by France were effective January 31, 1980, and only shipments which comply with the above stated regulations for France are being accepted in that country.

ROOT DISEASES

ANNOSUS ROOT ROT: *Fomes annosus* (Fr.) Cke.
(*Heterobasidion annosum* (Fr.) Bref.)

Surveys were intensified to evaluate occurrence and impact of this recently-observed disease of true fir. *Fomes annosus* was found within most white fir (*Abies concolor* (Gord. & Glend.) Hoopes) stands surveyed in southern Colorado. The fungus was also found on subalpine fir (*Abies lasiocarpa* (Hook.) Nutt.) located near infected white fir on the San Isabel National Forest. Most trees infected with *F. annosus* had been attacked by bark beetles (*Scolytus ventralis* and/or *Dryocoetes confusus*). Trees of all ages were killed with greater mortality occurring within cutover stands.

ARMILLARIA ROOT ROT: *Armillariella mellea* (Vahl. ex Fr.) Karst.

Armillaria root rot was common on many different conifer hosts within the Rocky Mountain Region. The disease was associated with subalpine fir mortality throughout the range of the host tree in Colorado and Wyoming. Certain portions of the Grand Mesa National Forest had extensive subalpine fir mortality. *A. mellea* diseased trees were often attacked by the western balsam bark beetle (*Dryocoetes confusus*). More detailed evaluations on potential impact of this root disease-bark beetle complex in true fir stands are planned.

BLACK STAIN ROOT DISEASE: *Ceratocystis wageneri* Goheen & Cobb
(= *Verticicladiella wageneri* Kendrick).

Black stain root disease was common on pinyon (*Pinus edulis* Engelm.) west of the Continental Divide in Colorado. Aerial surveys conducted within Mesa Verde National Park in spring of 1979 revealed fewer recently-fading trees than in previous years. Many previously killed trees had lost their foliage due to extensive snow and rainfall. Preliminary evaluations of fungus longevity in recently-killed trees and the role of insects in disease epidemiology were initiated.

Black stain disease centers on the San Juan National Forest, Dolores Ranger District, had considerable impact on the McPhee Reservoir Recreation Project. Disease severity resulted in removal of one area from consideration as a recreation complex and possible redesigning of another complex. More work will be conducted to evaluate potential disease impact within high-use recreation areas.

FOLIAGE DISEASES

ASPEN LEAF BLIGHT: *Marssonina populi* (Lib.) Magn.

Relatively severe leaf spot of aspen caused by *Marssonina populi* was reported over 800 acres on the Paonia Ranger District (Gunnison National Forest, Colorado). Most defoliation occurred in late September just prior to natural leaf fall. Impact on host trees is expected to be minimal.

CERCOSPORA BLIGHT OF JUNIPERS: *Cercospora sequoiae* var. *juniperi* Ell. and Ev.

Infection of eastern redcedar and Rocky Mountain juniper (*Juniperus scopulorum* Sarg.) in eastern Nebraska was at the highest level since 1975 and 1976.

COTTONWOOD LEAF RUST: *Melampsora medusae* Thum.

This leaf-spotting rust was common on cottonwoods within energy plantations at several locations in central and eastern Kansas during late September. Because of disease development late in the growing season, there will probably be little impact on hosts.

DIPLODIA TIP BLIGHT: *Diplodia pinea* (Desm.) Kickx.

Diplodia caused tip mortality throughout the southeastern area of South Dakota again this year (also see New Disease Reports).

DOTHISTROMA NEEDLE BLIGHT: *Dothistroma pini* Hulb.

Infections in 1979 were at the highest level in eastern Nebraska on ponderosa pine and Austrian pine (*Pinus nigra* Arnold) since 1975 and 1976. In Kansas infections were less common.

INK SPOT OF ASPEN: *Ciborinia whetzelii* (Seaver) Seaver.

Ink spot disease of aspen foliage occurred at endemic levels throughout the range of aspen in Colorado and Wyoming. However, heavy leaf spotting, necrosis, and premature abscission were found during August within portions of the Conejos Ranger District, Rio Grande National Forest, in southern Colorado. Many heavily infected stands were adjacent to roads. Disease impact in these stands is unknown.

ISLAND CHLOROSIS: Island chlorosis of hackberry was common throughout northeast and western Kansas. The cause is unknown. Disease expression is similar to a nutritional imbalance or virus disease.

NEEDLECASTS: Foliage diseases caused by needlecast fungi were at a low level in 1979 throughout the Region.

WALNUT ANTHRACNOSE: *Gnomonia leptostyla* (Fr.) Les. & de Not.

Black walnut (*Juglans nigra* L.) leafspot caused by *Marssonina* sp. (the imperfect state of *Gnomonia leptostyla*) was found within a plantation near Junction City, Kansas (Geary County). Twig and branch necrosis was uncommon. This disease may seriously limit walnut growth in heavily infected plantations.

NURSERY DISEASES AND STUDIES

AUSTRIAN PINE MORTALITY: Mortality of containerized Austrian pine seedlings within the Kansas State and Extension Forestry greenhouse (Manhattan) was reported. Necrosis began on terminal buds and progressed down the main shoot resulting in seedling mortality. Major fungi associated included *Rhizoctonia* sp., *Cytospora* sp., *Verticillium* sp., and *Genicularia* sp. Chemical control using PCNB (pentachloronitrobenzene) was initiated.

COTTONWOOD CUTTING CANKERS AND MORTALITY: Cottonwood cuttings grown in rooting beds at the Kansas State and Extension Forestry nursery (Manhattan) displayed stem cankers and occasional mortality. Fungi associated with cankers included *Cytospora* sp., *Alternaria* sp., *Verticillium* sp., *Curvularia* sp., and *Phomopsis* sp. Soil fumigation and fungicide control trials were not effective.

ENGELMANN SPRUCE TIP DIEBACK: Tip dieback of 1-0 Engelmann spruce (*Picea engelmanni* Parry ex Engelm.) seedlings at Bessey Nursery, Nebraska was reported. Necrotic tissues were apparently damaged by extremely cold winter temperatures or spring frosts and then colonized by facultative parasitic fungi such as *Phoma* sp., *Alternaria* sp., and *Fusicladium* sp.

LODGEPOLE PINE CHLOROSIS AND MORTALITY: *Phoma* sp.

Chlorosis and mortality of 1-0 lodgepole pine seedlings at Bessey Nursery, Nebraska was associated with soil nutrient imbalances and infection by *Phoma* sp. Excessive overhead irrigation, used primarily for wind erosion

control, caused accumulation of soil around the base and on foliage of some seedlings. These conditions were ideal for infection and damage by *Phoma* sp.

NURSERY FUMIGATION: Mt. Sopris Tree Nursery (USDA, Forest Service) was fumigated using Dowfume® MC-33 at 400 lb/acre. Fumigation was necessary because of high seedling losses caused by weeds and pathogenic fungi. Fumigation was done the fall prior to spring seeding. Fumigation dramatically reduced counts of fungi and weeds detected (Table 4). In 1978, two seed sources of ponderosa pine were sown in both fumigated and non-fumigated beds. Seedling survival was 3.6 times greater in fumigated beds at the end of the first growing season.

NATIONAL *PISOLITHIUS TINCTORIUS* MYCORRHIZAL STUDY: Four tree nurseries in the Region have been participating over the past two years in an evaluation of the ectomycorrhizal fungus *Pisolithus tinctorius* (Pers.) Coker & Couch (Table 5). The study, coordinated by the Institute for Mycorrhizal Research and Development and FIDM, includes plans for the outplanting of trees in the spring of 1980. A final report will be available after evaluation of seedling and mycorrhizal survival in outplantings.

NEW DISEASE REPORTS

DIPLODIA TIP BLIGHT: *Diplodia pinea* (Desm.) Kickx.

Tip blight caused by *Diplodia pinea* was found for the first time on mature native ponderosa pine within areas of the eastern and southern Black Hills of South Dakota. Disease appearance coincided with weather conditions ideal for infection and pathogen buildup. This disease is common on ornamental and windbreak Austrian pine in the eastern portions of South Dakota, Nebraska, and Kansas. The pathogen is also found occasionally on ponderosa pine in these areas. Plans are to assess impact and disease distribution in the Black Hills in 1980.

PINE WOOD NEMATODE: *Bursaphelenchus lignicolus* Mamiya & Kiyohara.

Extensive surveys for the pine wood nematode (causing the pine wilt disease) were conducted by the Kansas State Department of Agriculture, in cooperation with county extension agents and Pittsburg State University, throughout all eastern and southern counties of Kansas. Only four positive cases of nematode-killed pines were found (three Scots pines

(*Pinus sylvestris* L.) in Cherokee County and one Austrian pine (*Pinus nigra* Arnold) in Crawford County). No evidence of rapid spread has been detected.

Pine wood nematode was confirmed in a recently killed *Pinus strobus* tree on the University of Nebraska, East Campus (Lancaster county) in November 1979.

ABIOTIC DISEASES

AIR POLLUTION DAMAGE: The Air Pollution Control Division (Colorado Department of Health) found ozone levels in metropolitan Denver were lower in 1978 than in 1977. Data for 1979 is still being evaluated. There was insufficient monitoring outside Denver to determine trends in other parts of Colorado. Foliar symptoms resembling oxidant damage were found on ponderosa pine near Denver. Future oxidant monitoring in nearby mountain areas is planned to ascertain damage potential to forest trees.

HERBICIDE DAMAGE: Herbicides in the Great Plains (primarily phenoxy formulations) caused less damage this year. This was attributed to plentiful and timely rainfall. Damage to ornamental trees in Colorado was common.

UNIDENTIFIED PINE MORTALITY: Unidentified pine dieback and mortality have been occurring throughout Kansas since pines were introduced and has increased with increase in pine plantings. Damage in 1979 was considerable. The unusually high mortality in 1979 probably resulted from a combination of winter and drought stress. Scots pine and Austrian pine in the western half of Kansas were commonly affected.

WINTER DAMAGE: Ponderosa pines exhibiting needle tip dieback and reddening of foliage were found throughout northwestern Nebraska within and adjacent to Pine Ridge and on the Bessey District of the Nebraska National Forest in northcentral Nebraska. Weather records and general tree symptomatology suggests extremely cold winter temperatures or winter drying as possible causes of damage.

Winter burn occurred throughout South Dakota this year. Evergreens on the prairie were most affected. Ornamental arborvitae were often burned severely enough to cause mortality. A number of native ponderosa pines on marginal sites in the Black Hills also suffered winter burn.

OTHER DISEASES REPORTED

Causal Agent	Host(s)	Location(s)
Actinopelte sp.	Oak	Kansas
Agrobacterium tumefaciens	Cottonwood	Kansas
Alternaria sp.	Maple & elm	Kansas & Colorado
Arceuthobium douglasii	Douglas-fir	Colorado
Arceuthobium vaginatum subsp. *cryptopodum*	Ponderosa pine	Colorado
Bacteria	Cottonwood & willow	Kansas
Botryosphaeria sp.	Redbud & sweetgum	Kansas
Cephalosporium sp.	Elm	Colorado
Ceratocystis fimbriata	Aspen	Colorado
Cercospora sp.	Cedar, mulberry, & sweetgum	Kansas
Chrysomyxa arctostaphyli	Spruce	Colorado
Cladosporium sp.	Maple & spruce	Kansas & Colorado
Coniothyrium sp.	Elm	Kansas
Cumminsiella sanguinea	Mahonia	Colorado (nursery)
Cryptoporus volvatus	Douglas-fir	
Cylindrosporium sp.	Walnut	Kansas
Cytospora kunzei	Spruce	Colorado
Daedalea juniperina	Eastern redcedar	Nebraska
Dothiorella sp.	Elm & oak	Kansas
Echinodontium tinctorium	Fir	Colorado
Erwinia amylovora	Apple & pear	South Dakota
Fomitopsis pinicola	Ponderosa pine	Colorado
Fuligo sp.	Elm	Colorado
Ganoderma applanatum	Aspen	Colorado
Gleosporium sp.	Ash, oak, elm, maple, Hackberry & boxelder	Kansas
Gnomonia leptostyla	Walnut	Kansas
Gnomonia plantani	Sycamore	Kansas
Gnomonia ulmea	Elm	Kansas
Gymnosporangium bethelii	*Creataegus* sp.	Colorado
Gymnosporangium clavipes	Serviceberry	Colorado
Gymnosporangium juniperi-virginianae	Cedar	Kansas
Gymnosporangium nidus-avis	Juniper	Colorado
Hypoxylon mammatum	Aspen	Colorado
Hypoxylon sp.	Oak	Kansas
Marssonina populi	Cottonwood	Kansas & Colorado
Melamposorella caryophyllacearum	White fir	Colorado
Melampsora medusae	Cottonwood	Kansas

OTHER DISEASES REPORTED - (continued)

Causal Agent	Host(s)	Location(s)
Mycosphaerella so.	Ash	Kansas
Phellinus tremulae	Aspen	Colorado
Phibalis pruinosa	Aspen	Colorado
Phoradendron juniperinum	Juniper	Colorado
Phyllactinia sp.	Oak	Kansas
Phyllosticta sp.	Silver maple, ash, & cottonwood	Kansas
Phytophthora cactorum	Russian olive	Colorado
Pseudomonas pseudotsugae	Douglas-fir	Colorado
Puccinia sparganioides	Ash	Kansas
Septoria musiva	Cottonwood & popular	Kansas
Sirococcus strobilinus	Blue spruce	Kansas
Sour cream disease	Ponderosa pine	South Dakota
Sphaeropsis sp.	Blue spruce	Kansas
Taphrina caerulescens	Oak	Kansas
Wetwood	Cottonwood, willow, Poplar & elm	Kansas

FI&DM WORKSHOPS

During the past year the Forest Insect and Disease Management staff offered classroom and field training in the recognition and suppression of major forest insect and disease pests in the Region. Training consisted of two-day workshops held on the Pike and San Isabel and Nebraska National Forests. In addition to National Forest personnel, other Federal and State forest management agency personnel attended.

The workshops are available upon request by federal agencies for which FI&DM has responsibility for insect and disease detection and evaluation. State forestry personnel are also welcome to attend these sessions.

Four training sessions are planned each year. They are scheduled in late spring and fall to avoid conflict with field activities.

TABLE 1. Miles of lodgepole pine type surveyed 1977-79 and incidence of *Arceuthobium americanum* listed by National Forest in Region 2.

National Forest	Miles traversed within LPP type	Miles infested	% miles infested
Arapaho and Roosevelt	346	167	48.3
Bighorn	174	63	36.2
Grand Mesa, Uncompahgre, and Gunnison	77	40	51.9
Medicine Bow	440	266	60.5
Pike and San Isabel	112	48	42.9
Rio Grande	7	0	0
Routt	140	73	52.1
Shoshone	78	50	64.1
White River	81	29	35.8
TOTALS	1,455	736	50.5

TABLE 2. Occurrence of dwarf mistletoe, and its average ratings based on predominant understory plant species.

Predominant understory plant	Number of plots 1/	Percent with mistletoe	Average dwarf mistletoe rating
Shepherdia canadensis	12	50	1.3
Vaccinium scoparium	90	36	1.1
Juniperus communis	31	35	1.1
Arctostaphylos uva-ursi	41	29	1.0
Arnica cordifolia	12	33	0.7
Grass (no shrubs)	45	20	0.7

1/

Only types with at least 12 plots in the type are included.

TABLE 3. Miles of lodgepole pine type surveyed and incidence of *Cronartium comandrae* listed by Forest in the Rocky Mountain Region.

National Forest	Miles traversed within LPP type	Miles infested	% miles infested
Arapaho and Roosevelt	346	17	4.9
Bighorn	174	124	71.3
Grand Mesa, Uncompahgre, and Gunnison	77	0	0.0
Medicine Bow	440	135	30.7
Pike and San Isabel	112	20	17.9
Rio Grande	7	0	0.0
Routt	140	3	2.1
Shoshone	78	60	76.9
White River	81	5	6.2
TOTALS	1,455	364	25.0

TABLE 4. Numbers of pathogenic fungi and weeds detected in soils before and after fumigation at the Mt. Sopris Nursery 1976-79.

Year fumigated	1976	1977	1978	1979
Acres fumigated	25	25	20	21
Pythium (ppg) [a]	58/3 [b]	167/0	76/0	24/0
Fusarium (ppg) [a]	4440/880 [b]	6200/0	8367/60	3074/33
Weeds [c]	18/0 [b]	11/0	--	20/0

[a] propagules per gram soil

[b] before fumigation/after fumigation

[c] Numbers represent germinated weed seeds in a pan of soil 1-2 inches deep.

TABLE 5. Abbott-Pisolithus Nursery Testing Program - Participating Nurseries in Region 2

Nursery	Location	Ownership	Tree Species
Bessey Nursery	Halsey, Nebraska	USDA, Forest Service	Ponderosa pine
Big Sioux Conifer Nursery	Watertown, South Dakota	South Dakota State Division of Forestry	Ponderosa pine
Colorado State Forest Service Nursery	Fort Collins, Colorado	Colorado State Forest Service	Ponderosa pine
Mt. Sopris Tree Nursery	Carbondale, Colorado	USDA, Forest Service	Ponderosa pine
			Engelmann spruce

ACTIVE PROJECTS IN R-2

The following list represents projects currently underway by FI&DM staff members, Rocky Mountain Forest and Range Experiment Station, and State researchers. Only those workers who responded to our questionnaire are represented; therefore, this is a partial list.

INSECTS

Bark Beetles

Relationship between mountain pine beetle-caused tree mortality and (1) tree diameter, (2) basal area, (3) elevation, (4) aspect, (5) site, and (6) tree density. (RMFRES)

Mountain pine beetle brood production in dwarf mistletoe infected ponderosa pine. (RMFRES)

Importance of cerambycid woodborers in a declining mountain pine beetle outbreak. (RMFRES)

Effects of thinning on mountain pine beetle-caused ponderosa pine mortality in the Black Hills. (FI&DM)

Estimation of mountain pine beetle-caused tree mortality on the Colorado Front Range using high altitude aerial photography and ground sampling. (FI&DM)

Impact of mountain pine beetle-caused tree mortality on recreation and aesthetics. (FI&DM)

Development of a computer program for risk-rating spruce stands for susceptibility to spruce beetle attack. (RMFRES, Colorado State University)

Effects of a parasitic nematode (*Neoplectana carpocapsae*) on the mountain pine beetle. (Colorado State University)

Insect succession following a mountain pine beetle epidemic. (Colorado State University)

Defoliators

Impact of western spruce budworm defoliation on recreation and aesthetics. (FI&DM)

Incidence of parasitism on western spruce budworm after application of chemical insecticides. (RMFRES)

Distribution of western spruce budworm egg masses on white fir and Douglas-fir. (RMFRES)

Distribution of western spruce budworm parasites within tree crowns. (RMFRES)

Use of acephate implants for control of the ponderosa pine needle miner. (RMFRES; Colorado State Forest Service)

Relationship between pheromone trap catches of the pitch twig moth and actual population levels in shelterbelts. (RMFRES, Bottineau)

Control of the pitch twig moth in ponderosa pine shelterbelts using chemical insecticides. (RMFRES, Bottineau)

Effects of *Bacillus thuringiensis* and carbaryl (for cankerworm control) on nontarget insects in shelterbelts in eastern and northcentral North Dakota. (RMFRES, Bottineau; North Dakota State University)

Evaluation of Siberian elm tolerance to cankerworm defoliation. (RMFRES, Bottineau; SEA-AR, Mandan)

Relationship of defoliator and borer population sizes to impact of cankerworm defoliation on Siberian elms in shelterbelts. (RMFRES, Bottineau)

Biology of a pinyon tip moth, *Dioryctria* sp., on pinyon. (Colorado State University)

Biology and taxonomic characteristics of two species of pitch mass borers *Dioryctria ponderosae* and *Dioryctria* sp. near *okanaganella*. (Colorado State University)

Chemical control of *Dioryctria* sp. and *Zelleria* sp. moths on pinyon. (Colorado State University)

Western spruce budworm host-plant relationships. (Colorado State University)

Miscellaneous Insects

Effects of pheromone dispensers and pheromone isomer ratios on the attraction of adult male carpenterworms. (RMFRES, Bottineau)

Determination of the relationship between pheromone trap catches of male carpenterworms and population size. (RMFRES, Bottineau)

Determination of the identity, life history, and distribution of a weevil species damaging to green ash seed. (RMFRES, Bottineau)

Development of a guide for the identification, life history, and control of important potential pests of trees and shrubs in the Northern Great Plains. (RMFRES, Bottineau; FI&DM R-1)

Evaluation of spruce cone damage due to insects in Colorado. (RMFRES)

Effect of herbicide application on insects that occur in sagebrush sites. (RMFRES)

Monitoring walnut curculio damage in a walnut seed orchard in Kansas. (Kansas State and Extension Forestry)

Investigation of insects associated with eastern redcedar mortality in Kansas shelterbelts. (Kansas State and Extension Forestry)

Survey in Newton Hills State Park, South Dakota, of linden looper and bertha armyworm on bur oak and green ash. (South Dakota Game, Fish, and Parks)

DISEASES

Root Diseases

Surveys of root diseases in managed conifer stands in R-2. (FI&DM)

Fomes annosus on true firs in Colorado - distribution and impact. (FI&DM)

Verticicladiella wagenerii on pinyon at Mesa Verde National Park - disease spread characteristics and vector relationships. (FI&DM)

Interactions between root diseases and insects on true firs. (FI&DM)

Spread of *Armillariella mella* disease centers in managed pine stands. (FI&DM)

Dwarf Mistletoes

Lodgepole pine dwarf mistletoe surveys on the Gunnison National Forest. (FI&DM)

Dwarf mistletoe loss assessment. (FI&DM R-2; RMFRES; Methods Application Group, FIDM, Davis California)

Silvicultural control of dwarf mistletoe in young lodgepole pine stands. (FI&DM R-2; RMFRES)

Life cycle studies of lodgepole pine dwarf mistletoes. (RMFRES)

Taxonomy, host ranges, and geographic distribution of the genus *Arceuthobium*. (RMFRES)

Ecologic factors affecting the distribution and abundance of dwarf mistletoes. (RMFRES)

Economic analysis of dwarf mistletoe control in southwestern ponderosa pine. (RMFRES; INT; FI&DM R-3)

Development and refinement of yield simulation procedures for dwarf mistletoe-infested ponderosa pine and lodgepole pine stands. (RMFRES)

Silvicultural control of dwarf mistletoe on a large, commercial ponderosa pine forest (Mescalero Apache Reservation, New Mexico). (RMFRES)

Effects of thinning in dwarf mistletoe-infested ponderosa pine and lodgepole pine stands (Arizona and Colorado). (RMFRES)

Impact and rates of intensification of Douglas-fir dwarf mistletoe in the Southwest. (Univ. of Arizona; FI&DM R-3; RMFRES)

Development of a computer-based information retrieval system (FAMULUS) for the world mistletoe literature. (RMFRES)

Taxonomic status and epidemiology of *Peridermium* rust associated with lodgepole pine dwarf mistletoe. (CSU; RMFRES)

Cold hardiness of Rocky Mountain dwarf mistletoes. (CSU; RMFRES)

Stem Diseases

Development of a yield simulation program for comandra rust-infected lodgepole pine stands. (FI&DM R-2; RMFRES)

An evaluation of aspen cankers and stem rots in relation to timber harvesting methods. (FI&DM R-2; RMFRES)

Etiology of aspen cankers. (RMFRES)

The relationship between *Cryptosphaeria* canker and *Libertella* decay of aspen. (RMFRES)

Pathogenicity of Ceratocystis and Nectria-like cankers of aspen. (RMFRES; North Central For. and Range Exp. Sta.; University of Minnesota; Syracuse University)

Evaluations of canker diseases on energy plantation hardwoods in Kansas. (FI&DM R-2; Kansas State and Extension Forestry)

Evaluation of jack pine mortality on the Nebraska National Forest. (FI&DM R-2)

Evaluation of aspen harvesting practices in Colorado and New Mexico. (FI&DM R-2, R-3; RMFRES)

Decays

Rate of deterioration of beetle-killed Engelmann spruce in Colorado. (RMFRES)

Fomes fraxinophilus stem rot of green ash in natural stands in Nebraska. (RMFRES; FI&DM R-2)

Phellinus robineae stem decay of black locust: distribution, damage, and biology. (RMFRES)

Vascular Wilts

Dutch elm disease control demonstration project. (FI&DM R-2; Colorado State Forest Service and Cooperative Extension Service)

Foliage Diseases

Diplodia tip blight in the Black Hills of South Dakota. (FI&DM R-2; South Dakota Department of Game, Fish, and Parks)

Survey of the incidence of damage caused by conifer broom rusts in Colorado. (FI&DM R-2)

Foliage diseases of conifers in the Rocky Mountains and Southwest. (RMFRES)

Lophodermium needle casts of Scots pine Christmas trees; biology and control. (RMFRES; Northwest Christmas Tree Growers' Association)

Type specimen study of Lophodermia of pines. (RMFRES)

Evaluation of air pollution effects on forest vegetation in Colorado. (RMFRES, FI&DM R-2)

Dothistroma pini resistance in ponderosa pine. (RMFRES)

Inheritance of resistance to *Dothistroma pini* in Austrian pine. (Joint with RWU-1501; RMFRES)

Resistance to *Phomopsis juniperovora* in geographic sources of *Juniperus virginiana*. (RMFRES)

Resistance to *Cercospora sequoiae* var. *juniperi* in geographic soutces of *Juniperus virginiana* and *J. scopulorum*. (RMFRES)

Diplodia pinea tip blight of pines: etiology of stem infections. (RMFRES)

Herpobasidium deformans blight of honeysuckle: infection and control. (RMFRES)

Chemical control of maple leaf diseases in northeast Kansas. (Kansas State and Extension Forestry)

Recreation Site Pathology

Evaluation of hazardous trees in forested recreation sites and ski areas. (FI&DM R-2)

Nursery Diseases

Diseases of cottonwood cuttings at the Kansas State Forestry Nursery. (FI&DM R-2; Kansas State and Extension Forestry)

Diseases of containerized conifers at the Kansas State Forestry Nursery. (FI&DM R-2; Kansas State and Extension Forestry)

Mycorrhizae

Evaluation of *Pisolithus tinctorius* inoculum produced by Abbott laboratories for ectomycorrhizal development on pine species in container and bare-root nurseries in the Great Plains and Central Rockies. (FI&DM R-2)

Evaluation of *Pisolithus tinctorius* inoculum produced by Abbott Laboratories for ectomycorrhizal development on pine species in container and bare-root nurseries in the Great Plains. (RMFRES)

Siderophore production by mycorrhizal fungi: its importance in iron availability in terrestrial ecosystems. (University of Texas; Colorado State University)

Photosynthesis and carbon allocation in mycorrhizal pine seedlings. (Colorado State University)

Use of mycorrhizal conifers in the revegetation of high altitude mine waste sites. (Colorado State University)

Soil, root, and microorganism interactions affecting nutrient transformations in ecosystems. (Colorado State University)

Abiotic Diseases

Evaluation of air pollution effects on ponderosa pine in the Colorado Front Range. (FI&DM R-2; RMFRES)

Evaluation of salt damage to conifers along roadsides in Colorado. (FI&DM R-2)

Animal Damage

Evaluation of porcupine damage on plantation lodgepole pine on the San Juan National Forest. (FI&DM R-2)

Unknown Disorders

Etiology of an unknown disorder in Rocky Mountain aspen. (CSU; RMFRES)

USDA FOREST SERVICE DETECTION REPORT

FOREST INSECT AND DISEASE DAMAGE

FORM 3400-1

To encourage forest pest reporting for the Rocky Mountain Region, we invite all interested agencies to complete Form 3400-1. Instructions for completing the report are found at the top of the page on each form.

Copies of 3400-1 are available upon request from the Forest Service, State and Private Forestry, Forest Insect and Disease Management, 11177 West 8th Avenue, Post Office Box 25127, Lakewood, Colorado 80225, Phone (303) 234-4877.

Whenever possible, insect or disease specimens or damage samples should be submitted with the report. Resource managers of Federal forest lands should submit specimens for identification to the Forest Insect and Disease Management Staff at the above address. Managers of non-Federal forest lands in Colorado, Kansas, Nebraska, South Dakota, and Wyoming should send detection reports and specimens to their respective state forestry organizations. A complete listing follows:

STATE FORESTRY ORGANIZATIONS

Colorado State Forest Service
State Forester-Thomas B. Borden
Colorado State University
Fort Collins, Colorado 80523
Telephone: (303) 482-8185,
491-6304/6305

Kansas State and Extension Forestry
State and Extension Forester -
Harold G. Gallaher
Forestry Building, 2610 Claflin Road
Manhattan, Kansas 66502
Telephone: (913) 532-5752

Nebraska State and Extension Forestry
Chairman, Department of Forestry and
State Forester-Dr. Mitchell D. Ferrill
201 Miller Hall, University of Nebraska
Lincoln, Nebraska 68583
Telephone: (402) 472-2944

Department of Game, Fish,
and Parks
Director of Forestry -
James D. Verville
Sigurd Anderson Building
Pierre, South Dakota 57501
Telephone: (605) 773-3623

Wyoming State Forestry Division
State Forester-Carl E. Johnson
1100 West 22nd Street
Cheyenne, Wyoming 82002
Telephone: (307) 328-9586

PUBLICATIONS

(as of March 1980)

Forest Insect and Disease Management Staff

Region 2

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